# Fresno General Plan Rapid Fire Scenarios

## Scenarios and Co-benefits Analysis for GP Alternatives

Rev. 16 March 2012

This memo accompanies the delivery of RapidFire scenario analysis of the City of Fresno's General Plan alternatives. Calthorpe Associates is pleased to have performed this analysis for the City free of charge in order to inform decision making and public discussions about the relative impacts of the General Plan alternatives. We believe that Fresno is a critical player in Valley land use dynamics and that a more informed GP process serves Fresno, other cities, and the region in helping to contextualize the fiscal, environmental, and public health impacts of land use policy choices.

In order to produce the General Plan analysis, we translated each General Plan alternative into the RapidFire modeling framework and worked with City staff to ensure that model assumptions were appropriate for the analysis. The RapidFire model, which has been deployed statewide in the Vision California project, and at the regional and county scales in the San Francisco Bay Area, Southern California, Honolulu, and other regions, is used to quickly and efficiently develop scenarios that express the impacts of varying growth and infrastructure patterns on a variety of critical sustainability indicators, including:

- Land consumption
- Infrastructure cost (including capital and operations & maintenance (O&M))
- City/jurisdictional revenues
- Vehicle miles traveled (VMT) and fuel consumption
- Transportation GHG and air pollutant emissions
- Building energy and water consumption and related GHG emissions
- Household costs for transportation and utilities
- Public health (air pollution-related) impacts and costs

The analysis of the Fresno General Plan alternatives highlights the role land use can play in meeting Fresno's fiscal, environmental and public heath goals. When comparing GP Alternative A (increased infill and focused growth) to Alternative C (trend growth, less infill, expansion of the SOI), Alternative A illustrates that a more focused land use pattern:

- Saves nearly 10 square miles of land from development.
- Reduces passenger vehicle travel the equivalent of taking 40,000 cars off of Fresno roads for a year.
- Reduces gasoline use by 14.4 million gallons in 2035.
- Saves households an average of $1,240 a year from reduced auto fuel and utility bills.
- Reduces energy use enough to power over 9,000 homes.
- Saves enough water to serve 7,500 homes.
- Reduces capital and O&M costs for infrastructure by $162 million to 2035.
- Saves $13.8 million in health care costs due to reduced air-pollution related illnesses in 2035.

Note that all policies are held constant across all scenarios in order to highlight the impacts of General Plan land use variation on scenario performance. Policies for vehicle efficiency, carbon intensity of the fuel, power generation, and home energy and water efficiency and costs, are set at moderate rates that represent adopted or likely-to-be adopted policies in California and the Central Valley.

# Fresno General Plan Update Scenarios - (March 2012) - DISCUSSION DRAFT

15-Mar-12

| | Business as Usual (Calthorpe Backcast) | A. Revitalization, Infill, and Transit Corridors within SOI | B. Growth Area Development and Infill within SOI | C. Trend, Expands to SOI | D. Hybrid of A, B, and C |
|---|---|---|---|---|---|
| **New growth housing unit mix** | **BAU** | **A** | **B** | **C** | **D** |
| Single Family Large Lot | 70% | 15% | 16% | 31% | 24% |
| Single Family Small Lot | 10% | 24% | 23% | 21% | 22% |
| Townhome | 7% | 20% | 19% | 15% | 17% |
| Multifamily | 12% | 41% | 42% | 33% | 38% |
| | | | | | |
| **New growth housing units** | | | | | |
| Single Family Large Lot | 55,555 | 11,845 | 12,898 | 24,354 | 18,910 |
| Single Family Small Lot | 7,863 | 18,650 | 18,488 | 16,469 | 17,104 |
| Townhome | 5,860 | 15,924 | 14,650 | 11,892 | 13,302 |
| Multifamily | 9,722 | 32,581 | 32,965 | 26,286 | 29,685 |

# Fresno General Plan Update Scenarios - (March 2012) - DISCUSSION DRAFT

DISCUSSION DRAFT

15-Mar-12

| 2035 Annual Results | Business as Usual (Calthorpe Backcast) | A. Revitalization, Infill, and Transit Corridors within SOI | | | B. Growth Area Development and Infill within SOI | | | C. Trend, Expands to SOI | | | D. Hybrid of A, B, and C | | | ASSUMPTIONS | Rapid Fire calculated baseline |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Result | Result | Diff from BAU | Diff from Alt C | Result | Diff from BAU | Diff from Alt C | Result | Diff from BAU | Diff from Alt C | Result | Diff from BAU | Diff from Alt C | (Same assumptions used for all scenarios) | 2005 |
| **SCENARIO** | **BAU** | **A** | | | **B** | | | **C** | | | **D** | | | | **Baseline** |
| End-State Total Population, 2035 | *734,533* | *734,533* | | | *734,533* | | | *734,533* | | | *734,533* | | | *Growth projections assume 79,000 new units and 125,000 new jobs (by 2035, relative to 2010) for ALL scenarios.* | *454,736* |
| End-State Total Households, 2035 | *239,763* | *239,763* | | | *239,763* | | | *239,763* | | | *239,763* | | | | *147,945* |
| **Total Greenhouse Gas (GHG) Emissions** | | | | | | | | | | | | | | | |
| Total Emissions (Transportation Combustion and Buildings) (MMT) | 2.74 MMT | 2.17 MMT | -21% | -17% | 2.22 MMT | -19% | -15% | 2.62 MMT | -4% | 0% | 2.23 MMT | -19% | -15% | *Transportation GHG emissions include CO2-equivalent (CO2e) from passenger vehicle fuel combustion. Building emissions include CO2e from residential and commercial electricity and natural gas use.* | **2.4 MMT** |
| ICE Fuel Combustion Emissions (MMT) | 1.40 MMT | 0.96 MMT | -32% | -15% | 1.01 MMT | -28% | -9% | 1.12 MMT | -20% | 0% | 1.01 MMT | -28% | -10% | | 1.1 MMT |
| Building Emissions (Residential and Commercial) | 1.33 MMT | 1.21 MMT | -9% | -20% | 1.21 MMT | -9% | -20% | 1.51 MMT | 13% | 0% | 1.22 MMT | -8% | -19% | | 1.3 MMT |
| **Household Costs** | | | | | | | | | | | | | | | |
| Fuel and auto, energy, and water costs (2011$) | $15,682 | $11,520 | -27% | -11% | $11,997 | -23% | -8% | $13,002 | -17% | 0% | $12,007 | -23% | -8% | *Household costs reflect averages for ALL households (including existing households), expressed in 2011 dollars. Specific cost assumptions are further detailed below.* | |
| Household fuel and auto costs (2011$) | $11,919 | $8,132 | -32% | -15% | $8,614 | -28% | -9% | $9,513 | -20% | 0% | $8,570 | -28% | -10% | | |
| Household energy and water costs (2011$) | $3,763 | $3,387 | -10% | -3% | $3,383 | -10% | -3% | $3,489 | -7% | 0% | $3,437 | -9% | -1% | | |
| **Land Consumption** | | | | | | | | | | | | | | | |
| Greenfield Land Consumed, Gross (sq mi) | 46.6 sq mi | 21.7 sq mi | -53% | -31% | 25.1 sq mi | -46% | -21% | 31.7 sq mi | -32% | 0% | 25.7 sq mi | -45% | -19% | *Land consumption estimated based on per-capita rates, which vary by Land Development Category and are calibrated to past development patterns.* | |
| Greenfield Land Consumed, Gross (ac) | 29,806 ac | 13,909 ac | -53% | -31% | 16,055 ac | -46% | -21% | 20,263 ac | -32% | 0% | 16,435 ac | -45% | -19% | | |
| **Transportation** | | | | | | | | | | | | | | | |
| VMT (miles) | 4.41 B mi | 3.01 B mi | -32% | -15% | 3.19 B mi | -28% | -9% | 3.52 B mi | -20% | 0% | 3.17 B mi | -28% | -10% | ** All transportation results assume modest improvements in fuel economy (27 mpg by 2035), and LCFS-based emissions (A 10% reduction, or ~17.3 lbs CO2e/gal by 2035).* | 2.3 B mi |
| VMT per HH | 18,412 mi | 12,562 mi | -32% | -15% | 13,306 mi | -28% | -9% | 14,695 mi | -20% | 0% | 13,238 mi | -28% | -10% | | 15,498 mi |
| **VMT per Capita** | **6,010 mi** | **4,100 mi** | **-32%** | **-15%** | **4,343 mi** | **-28%** | **-9%** | **4,797 mi** | **-20%** | 0% | **4,321 mi** | **-28%** | **-10%** | | 5,042 mi |
| Fuel Consumed (gal) | 178.4 M gal | 121.7 M gal | -32% | -15% | 128.9 M gal | -28% | -9% | 142.4 M gal | -20% | 0% | 128.3 M gal | -28% | -10% | | 0.1 B gal |
| Fuel Cost (2011$) | $1.43 B | $0.97 B | -32% | -15% | $1.03 B | -28% | -9% | $1.14 B | -20% | 0% | $1.03 B | -28% | -10% | *Fuel cost assumed to reach $8 per gallon by 2035. (2011$)* | |
| Auto Ownership, Maintenance, and Additional Costs (2011$) | $1.43 B | $0.98 B | -32% | -15% | $1.03 B | -28% | -9% | $1.14 B | -20% | 0% | $1.03 B | -28% | -10% | *Auto ownership and maintenance costs assumed to be $0.32 per mile (2011$).* | |
| ICE Fuel Combustion Emissions (MMT) | 1.40 MMT | 0.96 MMT | -32% | -15% | 1.01 MMT | -28% | -9% | 1.12 MMT | -20% | 0% | 1.01 MMT | -28% | -10% | | 1 MMT |
| ICE Fuel Combustion Emissions per Capita (lbs) | 4,208 lbs | 2,871 lbs | -32% | -15% | 3,041 lbs | -28% | -9% | 3,358 lbs | -20% | 0% | 3,025 lbs | -28% | -10% | | 5,120 lbs |
| Criteria Pollutant Emissions (tons) | 5,447 tons | 3,717 tons | -32% | -15% | 3,937 tons | -28% | -9% | 4,347 tons | -20% | 0% | 3,917 tons | -28% | -10% | *Per-mile criteria pollutant emissions rates from EMFAC 2007.* | 87,578 tons |
| **Public Health** | | | | | | | | | | | | | | **Note: Express health impacts and costs only as DIFFERENCES between scenarios (e.g., Compared to Scenario C, Scenario A would result in $13.8 million less in health costs in 2035).** | |
| Annual Health Incidences | *7,460* | *5,090* | -32% | -15% | *5,391* | -28% | -9% | *5,954* | -20% | 0% | *5,364* | -28% | | | |
| Annual Health Costs (2011$) | *$119,085,532* | *$81,251,611* | -32% | -15% | *$86,061,987* | -28% | -9% | *$95,044,721* | -20% | 0% | *$85,624,000* | -28% | -10% | *assumptions developed by TIAX for the American Lung Association (Oct 2011).* | |
| **Building Energy** | | | | | | | | | | | | | | | |
| Residential Electricity Consumed (kWh) | 1,778 GWh | 1,578 GWh | -11% | -3% | 1,576 GWh | -11% | -3% | 1,633 GWh | -8% | 0% | 1,605 GWh | -10% | -2% | *Residential electricity and natural gas use for new units based on CEC RASS data by residential type, for Fresno's climate zone (Title 24 zone 13).Average energy use for existing units (7,860 kWh/unit and 420 thm/unit) based on normalized monthly usage for the City of Fresno, as reported by PG&E to the COF.* | |
| Residential Natural Gas Consumed (therms) | 88,222,640 thm | 83,402,521 thm | -5% | -2% | 83,354,420 thm | -6% | -2% | 84,683,320 thm | -4% | 0% | 84,044,368 thm | -5% | -1% | | |
| Residential Energy Consumed (Btu) | 14.9 tril Btu | 13.7 tril Btu | -8% | -2% | 13.7 tril Btu | -8% | -2% | 14.0 tril Btu | -6% | 0% | 13.9 tril Btu | -7% | -1% | | |
| Commercial Energy Consumed (Btu) | 8.8 tril Btu | 7.8 tril Btu | -11% | -3% | 7.9 tril Btu | -11% | -3% | 8.1 tril Btu | -9% | 0% | 7.8 tril Btu | -11% | -3% | *Commercial energy use for new and existing buildings based on average energy intensity of all commercial floorspace in Fresno's climate zone (CEC Forecasting Zone 3) - 12.8 kWh/sq ft; 0.27 thm/sq ft. Note that commercial energy use does not comprise all "non-residential" use, as it does not include industrial enerav use.* | |
| Total Energy Consumed (Btu) | 23.7 tril Btu | 21.6 tril Btu | -9% | -2% | 21.6 tril Btu | -9% | -2% | 22.1 tril Btu | -7% | 0% | 21.7 tril Btu | -8% | -2% | | |
| Residential Building Emissions (MMT) | 0.83 MMT | 0.76 MMT | -8% | -2% | 0.76 MMT | -8% | -2% | 0.78 MMT | -6% | 0% | 0.77 MMT | -7% | -1% | | |
| Commercial Building Emissions (MMT) | 0.50 MMT | 0.45 MMT | -11% | -3% | 0.45 MMT | -11% | -3% | 0.46 MMT | -9% | 0% | 0.45 MMT | -11% | -3% | | |
| Residential Electricity per HH (kWh) | 7,416 kWh | 6,583 kWh | -11% | -3% | 6,573 kWh | -11% | -3% | 6,809 kWh | -8% | 0% | 6,693 kWh | -10% | -2% | *Electricity emissions: 0.45 lbs/kWh in 2035 per Ssutainable Fresno Division based on input from PG&E. Natural gas emissions: 11.7 lbs/therm state average (no change, since emissions are constant).* | |
| Residential Natural Gas per HH (therms) | 368 thm | 348 thm | -5% | -2% | 348 thm | -6% | -2% | 353 thm | -4% | 0% | 351 thm | -5% | -1% | | |
| Residential Energy Use per HH (Btu) | 98.9 mil Btu | 90.0 mil Btu | -9% | -2% | 90.0 mil Btu | -9% | -2% | 92.2 mil Btu | -7% | 0% | 90.6 mil Btu | -8% | -2% | | |
| Residential Energy Cost ($) | $755 mil | $678 mil | -10% | -3% | $677 mil | -10% | -3% | $698 mil | -7% | 0% | $688 mil | -9% | -2% | *Electricity cost: $0.35 in 2035; natural gas cost: $1.50 per therm by 2035 (2011$). Per Sustainable Fresno Division, March 2012.* | |
| Residential Energy Cost per HH ($) | $3,148 | $2,826 | -10% | -3% | $2,822 | -10% | -3% | $2,913 | -7% | 0% | $2,868 | -9% | -2% | | |
| **Water** | | | | | | | | | | | | | | | |
| Water Consumed (AF) | 103,438 AF | 93,261 AF | -10% | -3% | 93,501 AF | -10% | -3% | 96,249 AF | -7% | 0% | 94,912 AF | -8% | -1% | *Water use based on average per-capita indoor water use rates, and outdoor rates based on Fresno's evapotranspiration zone and assumptions about lot size and irrigated area.* | |
| Water Cost ($) | $147 mil | $135 mil | -9% | -3% | $135 mil | -9% | -3% | $138 mil | -6% | 0% | $136 mil | -8% | -1% | | |
| Water Consumed per HH (gal) | 140,578 gal | 126,747 gal | -10% | -3% | 127,074 gal | -10% | -3% | 130,808 gal | -7% | 0% | 128,991 gal | -8% | -1% | | |
| Residential Water Cost per HH ($) | $615 | $562 | -9% | -3% | $561 | -9% | -3% | $576 | -6% | 0% | $569 | -8% | -1% | *Water cost: $1,500 per acre-foot (2011$), per Sustainable Fresno Division.* | |
| Water Consumed for new households only (AF) | 39,303 AF | 29,127 AF | -26% | -9% | 29,367 AF | -25% | -9% | 32,115 AF | -18% | 0% | 30,778 AF | -22% | -4% | | |
| Water use per new HH (gal) | 139,483 gal | 103,367 gal | -26% | -9% | 104,221 gal | -25% | -9% | 113,971 gal | -18% | 0% | 109,227 gal | -22% | -4% | | |
| Water cost per for new HH (2011$) | $51,267,900 | $38,437,223 | -25% | -8% | $38,306,989 | -25% | -9% | $41,890,831 | -18% | 0% | $40,146,823 | -22% | -4% | | |
| Water cost per new HH (2011$) | $558 | $419 | -25% | -8% | $417 | -25% | -9% | $456 | -18% | 0% | $437 | -22% | -4% | | |
| **Infrastructure (Cumulative results to 2035)** | | | | | | | | | | | | | | *Infrastructure costs are one-time costs that include the construction of streets, parks, water, and wastewater infrastructure. Operations and maintenance costs are ongoing costs that are incurred annually to maintain that infrastructure. Costs vary by dwelling unit type. Totals reflect cumulative costs to 2035.* | |
| Cumulative Infrastructure Cost (2011$) | $1.64 B | $1.27 B | -23% | -10% | $1.33 B | -19% | -6% | $1.41 B | -14% | 0% | $1.35 B | -18% | -4% | | |
| Cumulative Operations & Maintenance Cost (2011$) | $0.36 B | $0.30 B | -16% | -6% | $0.31 B | -15% | -5% | $0.32 B | -10% | 0% | $0.31 B | -13% | -3% | | |
| Cumulative Revenues (2011$) | $4.76 B | $4.62 B | -3% | 2% | $4.48 B | -6% | -1% | $4.51 B | -5% | | $4.60 B | -3% | 2% | | |

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15-Mar-12

## 2035 Annual Results

| | Business as Usual (Calthorpe Backcast) | A. Revitalization, Infill, and Transit Corridors within SOI | | | B. Growth Area Development and Infill within SOI | | | C. Trend, Expands to SOI | | | D. Hybrid of A, B, and C | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Result | Result | *Diff from BAU* | *Diff from Alt C* | Result | *Diff from BAU* | *Diff from Alt C* | Result | *Diff from BAU* | *Diff from Alt C* | Result | *Diff from BAU* | *Diff from Alt C* |
| **SCENARIO** | **BAU** | **A** | | | **B** | | | **C** | | | **D** | | |
| End-State Total Population, 2035 | *734,533* | *734,533* | | | *734,533* | | | *734,533* | | | *734,533* | | |
| End-State Total Households, 2035 | *239,763* | *239,763* | | | *239,763* | | | *239,763* | | | *239,763* | | |
| **Total Greenhouse Gas (GHG) Emissions** | | | | | | | | | | | | | |
| Total Emissions (Transportation Combustion and Buildings) (MMT) | 2.74 MMT | 2.17 MMT | -0.57 MMT | -0.46 MMT | 2.22 MMT | -0.51 MMT | -0.40 MMT | 2.62 MMT | -0.11 MMT | 0.00 MMT | 2.23 MMT | -0.51 MMT | -0.40 MMT |
| ICE Fuel Combustion Emissions (MMT) | 1.40 MMT | 0.96 MMT | -0.45 MMT | -0.16 MMT | 1.01 MMT | -0.39 MMT | -0.11 MMT | 1.12 MMT | -0.28 MMT | 0.00 MMT | 1.01 MMT | -0.39 MMT | -0.11 MMT |
| Building Emissions (Residential and Commercial) | 1.33 MMT | 1.21 MMT | -0.12 MMT | -0.29 MMT | 1.21 MMT | -0.12 MMT | -0.29 MMT | 1.51 MMT | 0.17 MMT | 0.00 MMT | 1.22 MMT | -0.11 MMT | -0.29 MMT |
| **Household Costs** | | | | | | | | | | | | | |
| Fuel and auto, energy, and water costs (2011$) | $15,682 | $11,520 | -$4,162 | -$1,482 | $11,997 | -$3,685 | -$1,005 | $13,002 | -$2,680 | $0 | $12,007 | -$3,675 | -$995 |
| Household fuel and auto costs (2011$) | $11,919 | $8,132 | -$3,787 | -$1,381 | $8,614 | -$3,305 | -$899 | $9,513 | -$2,406 | $0 | $8,570 | -$3,349 | -$943 |
| Household energy and water costs (2011$) | $3,763 | $3,387 | -$375 | -$102 | $3,383 | -$380 | -$106 | $3,489 | -$274 | $0 | $3,437 | -$326 | -$52 |
| **Land Consumption** | | | | | | | | | | | | | |
| Greenfield Land Consumed, Gross (sq mi) | 46.6 sq mi | 21.7 sq mi | -24.8 sq mi | -9.9 sq mi | 25.1 sq mi | -21.5 sq mi | -6.6 sq mi | 31.7 sq mi | -14.9 sq mi | .0 sq mi | 25.7 sq mi | -20.9 sq mi | -6.0 sq mi |
| Greenfield Land Consumed, Gross (ac) | 29,806 ac | 13,909 ac | -15,897 ac | -6,354 ac | 16,055 ac | -13,751 ac | -4,207 ac | 20,263 ac | -9,544 ac | ac | 16,435 ac | -13,372 ac | -3,828 ac |
| **Transportation** | | | | | | | | | | | | | |
| VMT (miles) | 4.41 B mi | 3.01 B mi | -1.40 B mi | -0.51 B mi | 3.19 B mi | -1.22 B mi | -0.33 B mi | 3.52 B mi | -0.89 B mi | 0.00 B mi | 3.17 B mi | -1.24 B mi | -0.35 B mi |
| VMT per HH | 18,412 mi | 12,562 mi | -5,849 mi | -2,133 mi | 13,306 mi | -5,106 mi | -1,389 mi | 14,695 mi | -3,717 mi | mi | 13,238 mi | -5,173 mi | -1,457 mi |
| **VMT per Capita** | **6,010 mi** | **4,100 mi** | **-1,909 mi** | **-696 mi** | **4,343 mi** | **-1,667 mi** | **-453 mi** | **4,797 mi** | **-1,213 mi** | mi | **4,321 mi** | **-1,689 mi** | **-475 mi** |
| Fuel Consumed (gal) | 178.4 M gal | 121.7 M gal | -56.7 M gal | -20.7 M gal | 128.9 M gal | -49.5 M gal | -13.5 M gal | 142.4 M gal | -36.0 M gal | 0.0 M gal | 128.3 M gal | -50.1 M gal | -14.1 M gal |
| Fuel Cost (2011$) | $1.43 B | $0.97 B | -$454 M | -$165 M | $1.03 B | -$396 M | -$108 M | $1.14 B | -$288 M | $0 M | $1.03 B | -$401 M | -$113 M |
| Auto Ownership, Maintenance, and Additional Costs (2011$) | $1.43 B | $0.98 B | -$454 M | -$166 M | $1.03 B | -$397 M | -$108 M | $1.14 B | -$289 M | $0 M | $1.03 B | -$402 M | -$113 M |
| ICE Fuel Combustion Emissions (MMT) | 1.40 MMT | 0.96 MMT | -0.45 MMT | -0.16 MMT | 1.01 MMT | -0.39 MMT | -0.11 MMT | 1.12 MMT | -0.28 MMT | 0.00 MMT | 1.01 MMT | -0.39 MMT | -0.11 MMT |
| ICE Fuel Combustion Emissions per Capita (lbs) | 4,208 lbs | 2,871 lbs | -1,337 lbs | -487 lbs | 3,041 lbs | -1,167 lbs | -317 lbs | 3,358 lbs | -849 lbs | 0 lbs | 3,025 lbs | -1,182 lbs | -333 lbs |
| Criteria Pollutant Emissions (tons) | 5,447 tons | 3,717 tons | -1,731 tons | -631 tons | 3,937 tons | -1,511 tons | -411 tons | 4,347 tons | -1,100 tons | tons | 3,917 tons | -1,531 tons | -431 tons |
| **Public Health** | | | | | | | | | | | | | |
| Annual Health Incidences | *7,460* | *5,090* | *-2,370* | *-864* | *5,391* | *-2,069* | *-563* | *5,954* | *-1,506* | *0* | *5,364* | *-2,096* | *-590* |
| Annual Health Costs (2011$) | *$119,085,532* | *$81,251,611* | *-$37,833,920* | *-$13,793,110* | *$86,061,987* | *-$33,023,544* | *-$8,982,734* | *$95,044,721* | *-$24,040,810* | *$0* | *$85,624,000* | *-$33,461,532* | *-$9,420,721* |
| **Building Energy** | | | | | | | | | | | | | |
| Residential Electricity Consumed (kWh) | 1,778 GWh | 1,578 GWh | -200 GWh | -54 GWh | 1,576 GWh | -202 GWh | -57 GWh | 1,633 GWh | -146 GWh | 0 GWh | 1,605 GWh | -174 GWh | -28 GWh |
| Residential Natural Gas Consumed (therms) | 88,222,640 thm | 83,402,521 thm | -4,820,118 thm | -1,280,799 thm | 83,354,420 thm | -4,868,220 thm | -1,328,900 thm | 84,683,320 thm | -3,539,319 thm | 0 thm | 84,044,368 thm | -4,178,272 thm | -638,952 thm |
| Residential Energy Consumed (Btu) | 14.9 tril Btu | 13.7 tril Btu | -1,164 bil Btu | -313 bil Btu | 13.7 tril Btu | -1,177 bil Btu | -326 bil Btu | 14.0 tril Btu | -851 bil Btu | 0.0 tril Btu | 13.9 tril Btu | -1,010 bil Btu | -159 bil Btu |
| Commercial Energy Consumed (Btu) | 8.8 tril Btu | 7.8 tril Btu | -973 bil Btu | -219 bil Btu | 7.9 tril Btu | -963 bil Btu | -210 bil Btu | 8.1 tril Btu | -753 bil Btu | 0.0 tril Btu | 7.8 tril Btu | -974 bil Btu | -221 bil Btu |
| Total Energy Consumed (Btu) | 23.7 tril Btu | 21.6 tril Btu | -2,136 bil Btu | -532 bil Btu | 21.6 tril Btu | -2,140 bil Btu | -536 bil Btu | 22.1 tril Btu | -1,604 bil Btu | 0.0 tril Btu | 21.7 tril Btu | -1,985 bil Btu | -381 bil Btu |
| Residential Building Emissions (MMT) | 0.83 MMT | 0.76 MMT | -0.07 MMT | -0.02 MMT | 0.76 MMT | -0.07 MMT | -0.02 MMT | 0.78 MMT | -0.05 MMT | 0.00 MMT | 0.77 MMT | -0.06 MMT | -0.01 MMT |
| Commercial Building Emissions (MMT) | 0.50 MMT | 0.45 MMT | -0.06 MMT | -0.01 MMT | 0.45 MMT | -0.06 MMT | -0.01 MMT | 0.46 MMT | -0.04 MMT | 0.00 MMT | 0.45 MMT | -0.06 MMT | -0.01 MMT |
| Residential Electricity per HH (kWh) | 7,416 kWh | 6,583 kWh | -833 kWh | -226 kWh | 6,573 kWh | -844 kWh | -236 kWh | 6,809 kWh | -607 kWh | 0 kWh | 6,693 kWh | -724 kWh | -117 kWh |
| Residential Natural Gas per HH (therms) | 368 thm | 348 thm | -20 thm | -5 thm | 348 thm | -20 thm | -6 thm | 353 thm | -15 thm | 0 thm | 351 thm | -17 thm | -3 thm |
| Residential Energy Use per HH (Btu) | 98.9 mil Btu | 90.0 mil Btu | -8.9 mil Btu | -2.2 mil Btu | 90.0 mil Btu | -8.9 mil Btu | -2.2 mil Btu | 92.2 mil Btu | -6.7 mil Btu | 0.0 mil Btu | 90.6 mil Btu | -8.3 mil Btu | -1.6 mil Btu |
| Residential Energy Cost ($) | $755 mil | $678 mil | -$77 mil | -$21 mil | $677 mil | -$78 mil | -$22 mil | $698 mil | -$56 mil | $0 mil | $688 mil | -$67 mil | -$11 mil |
| Residential Energy Cost per HH ($) | $3,148 | $2,826 | -$322 | -$87 | $2,822 | -$326 | -$91 | $2,913 | -$235 | $0 | $2,868 | -$279 | -$45 |
| **Water** | | | | | | | | | | | | | |
| Water Consumed (AF) | 103,438 AF | 93,261 AF | -10,177 AF | -2,988 AF | 93,501 AF | -9,936 AF | -2,747 AF | 96,249 AF | -7,189 AF | AF | 94,912 AF | -8,526 AF | -1,337 AF |
| Water Cost ($) | $147 mil | $135 mil | -$12.8 mil | -$3.5 mil | $135 mil | -$13.0 mil | -$3.6 mil | $138 mil | -$9.4 mil | $0.0 mil | $136 mil | -$11.1 mil | -$1.7 mil |
| Water Consumed per HH (gal) | 140,578 gal | 126,747 gal | -13,831 gal | -4,061 gal | 127,074 gal | -13,504 gal | -3,734 gal | 130,808 gal | -9,770 gal | gal | 128,991 gal | -11,587 gal | -1,817 gal |
| Residential Water Cost per HH ($) | $615 | $562 | -$54 | -$14 | $561 | -$54 | -$15 | $576 | -$39 | $0 | $569 | -$46 | -$7 |
| Water Consumed for new households only (AF) | 39,303 AF | 29,127 AF | -10,177 AF | -2,988 AF | 29,367 AF | -9,936 AF | -2,747 AF | 32,115 AF | -7,189 AF | AF | 30,778 AF | -8,526 AF | -1,337 AF |
| Water use per new HH (gal) | 139,483 gal | 103,367 gal | -36,117 gal | -10,605 gal | 104,221 gal | -35,262 gal | -9,750 gal | 113,971 gal | -25,512 gal | gal | 109,227 gal | -30,257 gal | -4,745 gal |
| Water cost for new HH (2011$) | $51,267,900 | $38,437,223 | -$12,830,677 | -$3,453,608 | $38,306,989 | -$12,960,911 | -$3,583,842 | $41,890,831 | -$9,377,069 | $0 | $40,146,823 | -$11,121,077 | -$1,744,008 |
| Water cost per new HH (2011$) | $558 | $419 | -$140 | -$38 | $417 | -$141 | -$39 | $456 | -$102 | $0 | $437 | -$121 | -$19 |
| **Infrastructure (Cumulative results to 2035)** | | | | | | | | | | | | | |
| Cumulative Infrastructure Cost (2011$) | $1.64 B | $1.27 B | -$375 M | -$143 M | $1.33 B | -$312 M | -$80 M | $1.41 B | -$233 M | $0 M | $1.35 B | -$296 M | -$63 M |
| Cumulative Operations & Maintenance Cost (2011$) | $0.36 B | $0.30 B | -$57 M | -$20 M | $0.31 B | -$54 M | -$17 M | $0.32 B | -$37 M | $0 M | $0.31 B | -$48 M | -$11 M |
| Cumulative Revenues ($) | $4.76 B | $4.62 B | -$140 M | $109 M | $4.48 B | -$275 M | -$27 M | $4.51 B | -$248 M | $0 M | $4.60 B | -$158 M | $90 M |

### EQUIVALENCIES *Alt A compared to Alt C*

*(Same assumptions used for all scenarios)*

**GREENHOUSE GAS EMISSIONS**

Reduces total annual GHGs by the same amount sequestered by 185,000 acres of trees -- or 11.7 million tree seedlings grown for 10 years.

**HOUSEHOLD COSTS**

**$1,480** savings per household, per year in auto and utility costs.

**LAND CONSUMPTION**

Nearly 10 square miles of land saved.

**TRANSPORTATION**

Over **40,000 cars** off Fresno's roads.

21 million gallons less fuel consumed in 2035 -- over 2,400 tanker trucks' worth of gas, or over a million barrels of oil.

**HEALTH IMPACTS**

**$13.8 million** less in healthcare spending for air pollution-related illnesses in 2035.

**ENERGY**

Enough energy saved annually to power over 9,000 homes.

**WATER**

Enough water saved annually to serve over 7,500 homes.

Over 10,000 gallons saved per new household.

**INFRASTRUCTURE COSTS**

**$162 million** less in local spending to build, operate, and maintain infrastructure by 2035.

### EQUIVALENCIES *Alt A compared to BAU*

*(Same assumptions used for all scenarios)*

**GREENHOUSE GAS EMISSIONS**

Reduces annual total GHGs by the same amount sequestered by 230,000 acres of trees -- or 14.5 million tree seedlings grown for 10 years.

**HOUSEHOLD COSTS**

**$4,160** savings per household, per year in auto and utility costs.

**LAND CONSUMPTION**

Nearly 25 square miles of land saved.

**TRANSPORTATION**

Over **114,000 cars** off Fresno's roads.

57 million gallons less fuel consumed in 2035 -- over 6,600 tanker trucks' worth of gas, or over 2.8 million barrels of oil.

**HEALTH IMPACTS**

**$37.8 million** less in healthcare spending for air pollution-related illnesses in 2035.

**ENERGY**

Enough energy saved annually to power over 37,000 homes.

**WATER**

Enough water saved annually to serve over 26,000 homes.

Over 36,000 gallons saved per new household.

**INFRASTRUCTURE COSTS**

**$432 million** less in local spending to build, operate, and maintain infrastructure by 2035.